

Performance Characterization of Alternative Hypergolic Propellants

Completed Technology Project (2014 - 2017)



Project Introduction

In an effort to expand upon the nation's leadership and excellence in space technology, NASA must continuously innovate. Development of a stable, nontoxic hypergolic propellant option will produce more effective, affordable, and sustainable space exploration capabilities on all scales. The efforts described in this proposal will focus on the parallel investigation of new green propellants in both their neat and gelled forms based on parameters important to rocket applications including ignition delay, characteristic velocity, and specific impulse. Drop tests will be performed to identify candidate green propellants. Selected samples will be further evaluated in a rocket test article at pressure up to 200 psia to compare against the state-of-the-art baseline of monomethylhydrazine and red-fuming nitric acid measured in the same article. These findings will allow rapid iteration on alternative liquid hypergols and the potential investigation of gelling options to reduce, and ideally, eliminate instability, toxicity and the performance gap relative to MMH/RFNA. Discoveries will most directly further NASA's In-Space Propulsion Technology Area Roadmap (02) by producing green, high energy density liquid and gelled bipropellants. The advancement of safer hypergolic propellants that meet or potentially even exceed the current performance standard will drastically reduce cost and risk currently limiting their implementation while heeding the call for a greener stewardship of Earth.

Anticipated Benefits

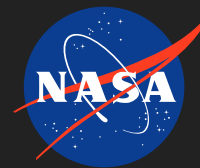
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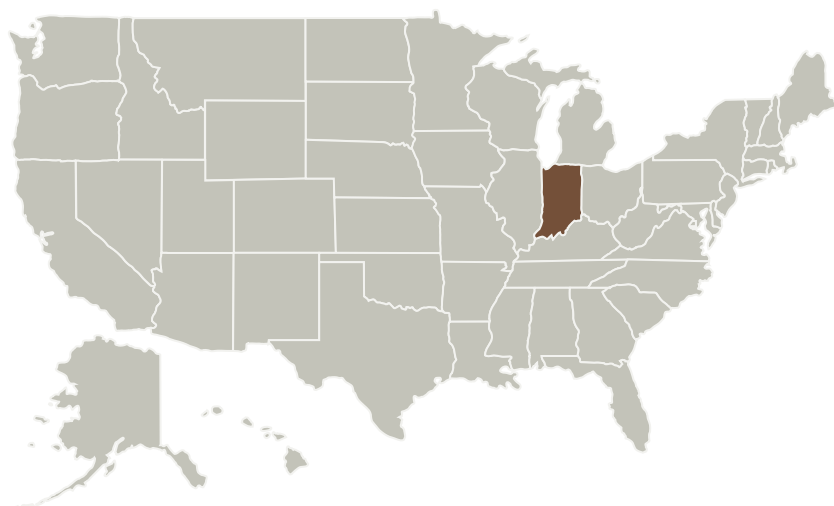
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Purdue University-Main Campus	Lead Organization	Academia	West Lafayette, Indiana

Primary U.S. Work Locations

Indiana

Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Purdue University-Main Campus

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:

Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

Timothee L Pourpoint

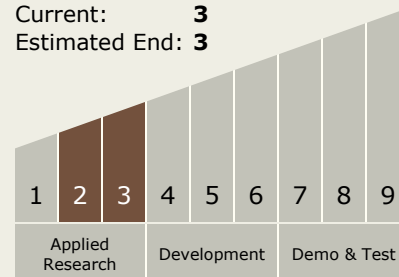
Co-Investigator:

Jared D Willits



Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.1 Chemical Space Propulsion
 - └ TX01.1.6 Gels

Target Destinations

The Moon, Foundational Knowledge, Earth